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ABSTRACT

This curriculum guide is intended to train trade and industrial education students in the hands-on aspects of the occupation of data processor. Included in the guide are course outlines that address the following topics: developing job descriptions; performing power-on and power-off procedures; loading the operating systems, programs, files, and databases; running tests on programs; copying data; loading paper into a printer; changing ribbon in a printer; preparing job instructions for key operators; setting up work stations; troubleshooting equipment; correcting and recovering data; preparing printouts; terminating operations; coding applications; analyzing computer input and output; and developing documentation narratives. Each course outline contains some or all of the following: a duty; a task statement; a performance objective and performance guide; suggested learning activities; a list of recommended resources; student evaluation criteria, including answers to any evaluation questions or exercises provided; a lesson test; test answers; and attachments (including handouts, forms, and transparency masters). Appendixes to the guide include definitions of terms, a tool and equipment list, a bibliography, a duty and task list, and written evaluation questions and answers. (MN)

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V-TECS GUIDE

FOR

DATA PROCESSING

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INTRODUCTION

A V-TECS guide is an extension or continuation of a V-TECS catalog. While the V-TECS catalog compiles duties, tasks, performance objectives, and performance guides, it deals only with the psychomotor aspect of an occupation. A V-TECS catalog is a blueprint; an identification of the "hands on" aspect of the job. The catalog does not take into consideration such areas as the background information surrounding a task and how to make inferences, generalizations, and decisions from a body of knowledge, nor does it deal with attitudes, job seeking skills, safety, or energy conservation practices. The purpose of the V-TECS guide is to take these aspects of teaching and learning into consideration.

The **Data Processing V-TECS Curriculum Guide** is based on the following three catalogs: **Computer Operator**, **Data Entry Operator**, and **Programmer**.

Experience has shown that the art of learning can also be taught while teaching subject matter. People need to learn how to learn. The V-TECS guide is aware of how students learn and is an efficient way for instructors to assist students to learn.

The V-TECS guide is centered around all three domains of learning: psychomotor, cognitive, and affective. The following paragraphs will give a brief explanation of each area.

Psychomotor
Manipulative skills such as loading a printer, keying data into a computer, changing a ribbon, and filing tapes and disks are examples of manipulative or psychomotor skills. Tasks such as these are identified in a V-TECS catalog and grouped by duties and objectives. Each performance objective has a performance standard which must be met to prove student proficiency in the manipulative aspect of the task. The V-TECS catalog, however, does not include any suggestions with regard to learning to do these tasks. The V-TECS guide is developed around psychomotor tasks which are worker-oriented.

Cognitive
To perform psychomotor tasks, students must think. To load a printer, they must know when and how to raise and move paper tracts along with engaging the paper on the pin feed and closing paper tractors. There is a certain technique to aligning the paper properly using adjustment controls. This involves cognition or mental activity. Cognition is what goes on in the mind about any job being done. A V-TECS guide provides both the collateral knowledge and the impetus to apply cognition to psychomotor tasks.

Cognition, then, is that process by which information is stored and used. That voice that warns one of potential dangers is cognition. A student may become the best worker at his/her job; but if he/she fails to think a process through and apply any available experience, he/she may become just another statistic. Cognition causes the student to turn off the power supply to a printer before attempting to clear a paper jam. Good cognition or thinking can help an employee do a job better and quicker. A V-TECS guide provides for the cognitive aspects of learning.

Affective

Curriculum writers, supervisors, and instructors often fail to assist a student in acquiring a positive attitude toward self, job, school or fellow students. The V-TECS guide seeks to provide assistance to the instructor in this area. It is difficult for the instructor to identify each aspect of desirable behavior for every unit and often harder yet to teach them. In this area, a student might be judged on the housekeeping in the work area, punctuality, and ability to carry out directions. Potential employers are interested in student attitude because an angry or uncertain person is often a poor worker.

A student's ability to succeed on the first job and every job thereafter depends largely on attitude. If a student has the attitude of "let someone else do it," job deficiency will probably result. A student using a V-TECS guide will have participated in activities dealing with getting along with others, with supervisors or staff members, and with large and small groups.

Enabling objectives which are statements describing knowledge and/or attitudes needed as a prerequisite were added to each task.

USE OF A V-TECS GUIDE

The V-TECS guide is designed to provide job-relevant tasks, performance objectives, performance guides, resources, learning activities, evaluation standards, and achievement testing in selected occupations. The V-TECS guide is also designed to be used with any teaching methods you, as an instructor, may choose. If the lecture/demonstration method is best for you, you will find sufficient help to meet your needs. If you prefer to use discussions or other methods that require student participation, you will find ample help. Regardless of which method is successful for you, a V-TECS guide can save preparation time and offer innovative methods and procedures. For example, a student may work either alone or on a team while in class and learn skills in direct relation to what is actually being done on the job. This approach also takes into consideration a student's attitudes, thinking skills, and mathematical reading skills.

The use of small groups in teaching can be helpful since many students may feel inadequate due to their lack of background information in mechanical things. Some students may also feel that they are physically incompetent or lack the necessary background experiences. A successful program (course) can provide students with a sense of security by reinforcing positive attitudes while improving their skills and subject knowledge. By allowing students to interact on a personal level, this task/learner-centered approach can achieve this. As students gain confidence and discover they are an essential part of a team engaged in the learning-teaching process, their confidence increases. The student in their setting will also learn to work without direct supervision. In addition, use of the small-group method permits the instructor to vary instructional routines away from lecture or other full-class methods to activities for single students, pairs of students, or any number so desired.

In the V-TECS guide, you will find suggestions for specific classroom activities. These activities are not meant to restrict you or your students, but only to suggest a variety of learning activities for each task statement. Please do not feel that each student must complete all the activities.

A COURSE IN

DATA PROCESSING

DUTY OR UNIT: PERFORMING SUPERVISORY FUNCTIONS

PERFORMANCE OBJECTIVE 1

TASK: Develop job descriptions.

CONDITIONS: Job requirements

STANDARD: All duties, responsibilities and limitations of the position must be stated. Equipment use and special skills required must be listed. Criteria for evaluation of job performance are stated.

SOURCE FOR STANDARD:
Consensus of writing team composed of incumbent computer operators.

PERFORMANCE GUIDE
1. Identify position title.
2. Determine direct supervisor.
3. List duties of position.
4. List responsibilities of position.
5. Note limitations of position.
6. List equipment to be operated.
7. List special skills required.
8. Identify criteria for evaluation of job performance.

ENABLING OBJECTIVE
Reading comprehension on at least 8th grade level

LEARNING ACTIVITIES
1. Identify computer-related career opportunities.
2. Discuss the education that is required for various computer-related careers.
3. Describe the range of careers from entry-level to management level.
4. Discuss how to communicate with various kinds of computer personnel that may be encountered.
5. Distribute a list of job requirements and have students develop a description for that position.

RESOURCES
Brenan and Mandell. **Introduction to Computers and BASIC Programming,** pp. 356-369.
Wanous, et. al. **Fundamentals of Data Processing,** pp. 387-404.

EVALUATION

Practical Application

Develop a job description from a list of requirements provided by the instructor.

Method of Evaluation

Observation by instructor using the performance guide and the checklist. All items must be rated acceptable.

CHECKLIST: DEVELOPING JOB DESCRIPTIONS

	ACTIVITY	RATING	
		Acceptable	Unacceptable
1.	Described position title by function of the job.	_____	_____
2.	Identified direct supervisor.	_____	_____
3.	Listed all duties of the position.	_____	_____
4.	Listed all responsibilities of the position.	_____	_____
5.	Stated limitations of the position.	_____	_____
6.	Listed equipment to be operated.	_____	_____
7.	Listed special skills required.	_____	_____
8.	Listed criteria for evaluation of job performance.	_____	_____

Student's Name _____

Evaluated By _____ Date _____

DUTY OR UNIT: PROCESSING DATA USING COMPUTER EQUIPMENT

PERFORMANCE OBJECTIVE 2

TASK: Perform power-on procedures.

CONDITIONS: A computer system with all equipment turned off.

STANDARD: At the conclusion of the power-on procedures, all equipment must be operational.

SOURCE FOR STANDARD:
Consensus of writing team composed of incumbent computer operators

PERFORMANCE GUIDE

1. Turn on central processing unit.
2. Turn on disk drives.
3. Turn on tape drives.
4. Turn on printer.
5. Turn on card reader/punch.*
6. Verify that all equipment is operational.

ENABLING OBJECTIVE
Ability to follow directions

LEARNING ACTIVITIES

1. Explain rules for care of the computer.
2. Describe the care of the software.
3. Demonstrate how to turn on peripherals and the computer.
4. Explain the meaning of any messages that might appear on the video display.
5. Explain and demonstrate the special keys to be used.

RESOURCES
Operation manual for computer being used

EVALUATION

Practical Application
Perform power-on procedures on a computer system which has had all equipment turned off.

Method of Evaluation
Observation by instructor using the performance guide and checklist. All items must be rated acceptable.

*The South Carolina Curriculum Writing Team recommends the deletion of the card reader/punch procedure if keypunch equipment is not available.

CHECKLIST: PERFORMING POWER-ON PROCEDURES

	ACTIVITY	RATING Acceptable	Unacceptable
1.	Followed all rules for care of computer.	_____	_____
2.	Turned on peripherals.	_____	_____
3.	Turned on computer.	_____	_____
4.	Responded to messages that appeared on video display, if applicable.	_____	_____
5.	Demonstrated use of special keys, if applicable.	_____	_____

Student's Name _____

Evaluated By _____ **Date** _____

DUTY OR UNIT: PROCESSING DATA USING COMPUTER EQUIPMENT

PERFORMANCE OBJECTIVE 3

TASK: Perform power-off procedures.

CONDITIONS: An operating computer system

STANDARL: At the conclusion of the power-off procedures, all equipment must be off.

SOURCE FOR STANDARD:
Concensus of writing team composed of incumbent computer operators

PERFORMANCE GUIDE
1. Issue shutdown command at console.
2. Turn off disk drive.
3. Turn off tape drive.
4. Turn off printer.
5. Turn off card reader/punch.*
6. Turn off central processing unit.
7. Verify that all equipment is off.

ENABLING OBJECTIVE
Ability to follow directions

LEARNING ACTIVITIES
1. Describe care of software when removing it from computer.
2. Emphasize the importance of not taking software out when computer is in operation.
3. Demonstrate how to turn off the computer and peripherals.
4. Explain importance of not turning computer back on for at least 15 seconds.
5. Discuss importance of saving information before turning off the computer.

RESOURCES
Operation manual for computer being used

EVALUATION
Practical Application
Perform power-off procedures on an operating computer system.

Method of Evaluation
Observation by instructor using the performance guide and the checklist. All items must be rated acceptable.

*The South Carolina Curriculum Writing Team recommends the deletion of the card reader/punch procedure if keypunch equipment is not available.

CHECKLIST: PERFORMING POWER-OFF PROCEDURES

	ACTIVITY	RATING Acceptable	Unacceptable
1.	Followed all rules for care of software.	_____	_____
2.	Turned off computer.	_____	_____
3.	Turned off peripherals.	_____	_____
4.	Explained the importance of waiting to turn computer back on.	_____	_____
5.	Explained the importance of saving information before turning off the computer.	_____	_____

Student's Name _____

Evaluated By _____ Date _____

DUTY OR UNIT: PROCESSING DATA USING COMPUTER EQUIPMENT

PERFORMANCE OBJECTIVE 4

TASK: Load the operating system.

CONDITIONS: A computer system with completed power-on procedures and an operating system disk.

STANDARD: A **Start** message must be received on the console after loading system is loaded into main memory.

SOURCE FOR STANDARD:
Consensus of writing team composed of incumbent computer operators

PERFORMANCE GUIDE
1. Place the operating system in an input-output device and make it ready.
2. Instruct console unit to read operating system into main memory.
3. Respond to **Start** message.

ENABLING OBJECTIVE
Ability to follow directions

LEARNING ACTIVITIES
1. Identify the different types of system programs and their purposes.
2. Discuss the operating system that your computer uses.
3. Demonstrate the procedure for inserting the system disk.
4. Demonstrate how to load the system disk and begin start-up dialog.
5. Explain what to do when the start-up dialog appears.

RESOURCES
Brenan and Mandell. **Introduction to Computers and BASIC Programming.**
Operation manual for computer being used or the disk system owner's manual.

EVALUATION
Practical Application
Load the operating system of a computer system after power-on procedures are complete.

Method of Evaluation
Observation by instructor using the performance guide and the checklist. All items must be rated acceptable.

CHECKLIST: LOADING THE OPERATING SYSTEM

	ACTIVITY	RATING Acceptable	Unacceptable
1.	Inserted the system disk.	_____	_____
2.	Loaded the system disk and began start-up dialog.	_____	_____
3.	Followed start-up dialog.	_____	_____

Student's Name _____

Evaluated by _____ Date _____

DUTY OR UNIT: PROCESSING DATA USING COMPUTER EQUIPMENT

PERFORMANCE OBJECTIVE 5

TASK: Load programs, files, or data base.

CONDITIONS: Programs, files, or data base to be run on computer and input device

STANDARD: Programs, files, or data base must be loaded into main memory so that the program will begin executing.

SOURCE FOR STANDARD:
Shelly and Cashman. **Introduction to Computers and Processing.**
129 Card Data Recorder — Operator's Reference Manual, p. 14.

PERFORMANCE GUIDE
1. Identify program storage media (cards, tape, disk).
2. Place program on designated input device.
3. Load program into memory.
4. Respond to program execution messages.

ENABLING OBJECTIVE
Ability to follow directions

LEARNING ACTIVITIES
1. Explain how punched cards and magnetic media differ in storage of data.
2. Describe some source-data automated devices and tell how they differ from each other.
3. Discuss the differences between impact and nonimpact printers and give examples of each.
4. Give examples of some special-purpose output devices.
5. Demonstrate how to load program into memory and to respond to program execution messages.

RESOURCES
Brenan and Mandell. **Introduction to Computers and BASIC Programming,** pp. 45-63.
Operational manual for computer being used

EVALUATION
Practical Application
Load a program into main memory so that it will begin executing.

Method of Evaluation
Observation by instructor using the performance guide and the checklist. All items on checklist must be rated acceptable.

LEARNING ACTIVITIES

1. Explain how punched cards and magnetic media differ in storage of data.
2. Describe some source-data automated devices and tell how they differ from each other.
3. Discuss the differences between impact and nonimpact printers and give examples of each.
4. Give examples of some special-purpose output devices.
5. Demonstrate how to load program into memory and to respond to program execution messages.

RESOURCES

Brenan and Mandell. **Introduction to Computers and BASIC Programming,** pp. 45-63

Operational manual for computer being used

EVALUATION

Practical Application

Load a program into main memory so that it will begin executing.

Method of Evaluation

Observation by instructor using the performance guide and the checklist. All items on checklist must be rated acceptable.

CHECKLIST: LOAD PROGRAMS, FILES, OR DATA BASE

	ACTIVITY	RATING Acceptable	Unacceptable
1.	Identified program storage media.	_____	_____
2.	Placed program in designated input device.	_____	_____
3.	Loaded program into memory.	_____	_____
4.	Responded to program execution messages.	_____	_____

Student's Name _____

Evaluated By _____ Date_____

DUTY OR UNIT: PROCESSING DATA USING COMPUTER EQUIPMENT

PERFORMANCE OBJECTIVE 6

TASK: Run tests on programs

CONDITIONS: A computer program, computer hardware, computer software.

STANDARD: Program printout must be obtained.

SOURCE FOR STANDARD:
Consensus of writing team composed of incumbent computer operators.

PERFORMANCE GUIDE

1. Read program into the system.
2. Initiate program.
3. Process program.
4. Print program results.

ENABLING OBJECTIVE

Ability to follow directions

LEARNING ACTIVITIES

1. Review the steps in loading a program into the computer.
2. Discuss how to search for a program if there are several on the disk or tape.
3. Demonstrate and discuss the commands that must be used in order to list the program you have loaded for verification.
4. Demonstrate and discuss the commands that must be used in order to run the program you have loaded.
5. Discuss and demonstrate how to activate the printer.

RESOURCES

Operation manual for computer being used

EVALUATION

Practical Application
Run a program and print the program results. Information will be provided by the instructor.

Method of Evaluation
Observation by instructor using the performance guide and the checklist. All items must be rated acceptable.

CHECKLIST: RUN TESTS ON PROGRAMS

	ACTIVITY	RATING Acceptable	Unacceptable
1.	Loaded program into system.	_____	_____
2.	Read program into system.	_____	_____
3.	Initiated program.	_____	_____
4.	Processed program.	_____	_____
5.	Printed program results.	_____	_____

Student's Name _____

Evaluated By _____ **Date** _____

DUTY OR UNIT: PERFORMING DATA CONTROL FUNCTIONS

PERFORMANCE OBJECTIVE 7

TASK: Copy data.

CONDITIONS: Data to be copied, computer hardware, computer software.

STANDARD: Copy must be exact duplicate of original data.

SOURCE FOR STANDARD:
Consensus of writing team of incumbent data entry operators

PERFORMANCE GUIDE

On-line

1. Identify data to be copied.
2. Log on.
3. Locate data to be copied.
4. Create a name for the new data.
5. Enter copy command.
6. Verify creation of the copied data.
7. Log off.

Off-line*

1. Set up keying equipment for duplication.
2. Place blank recording medium in equipment.
3. Place medium containing data to be copied into read station.
4. Duplicate data.
5. Remove media from equipment.
6. Verify accuracy of keyed data of keypunches by sightchecking.

ENABLING OBJECTIVE
Ability to follow directions

*The South Carolina Curriculum Writing Team recommends the deletion of the off-line procedure if keypunch equipment is not available.

LEARNING ACTIVITIES

1. Review the steps in turning on the computer and loading the program.
2. Discuss the need to copy data that has already been recorded on the disk or tape.
3. Demonstrate the steps for preparing a backup copy.
4. Explain formatting, source drive, destination drive, and password.
5. Demonstrate how to format a disk.

RESOURCES

Operational manual for computer being used

EVALUATION

Practical Application

Locate data to be copied and copy the data.

Method of Evaluation

Observation by instructor using the performance guide and the checklist. All items must be rated acceptable.

CHECKLIST: COPY DATA

	ACTIVITY	RATING Acceptable	Unacceptable
1.	Identified data to be copied.	_____	_____
2.	Performed power-on procedures.	_____	_____
3.	Located data to be copied.	_____	_____
4.	Created a name for the new data.	_____	_____
5.	Entered copy command.	_____	_____
6.	Verified creation of the copied data.	_____	_____
7.	Performed power-off procedures.	_____	_____

Student's Name _____

Evaluated By _____ Date _____

DUTY OR UNIT: PROCESSING DATA USING COMPUTER EQUIPMENT

PERFORMANCE OBJECTIVE 8

TASK: Load paper in printer.

CONDITIONS: Continuous paper to be loaded in printer, computer printer

STANDARD: When loaded, printer will be operable, paper will be aligned, and carriage control tape will be set.

SOURCE FOR STANDARD:
Consensus of writing team composed of incumbent computer operators

PERFORMANCE GUIDE

1. Insure that adequate supply of paper is available for printing job.
2. Raise covers necessary to expose printer controls.
3. Move printing mechanism.
4. Raise paper tractors and remove any unused paper from printer.
5. Move paper tractors to proper position.
6. Engage paper on pin feed and close paper tractors.
7. Tighten tension with right-hand paper tractors.
8. Align paper with print mechanism using adjustment controls.
9. Set carriage control tape so that print is aligned on paper.*
10. Close cover(s).
11. Press start key.

ENABLING OBJECTIVE
Ability to follow directions

*South Carolina Curriculum Writing Team: Carriage control tape is not applicable on mini-printers.

LEARNING ACTIVITIES

1. Identify the types of printers.
2. Discuss the types of paper used for different jobs.
3. Show how the printer is connected to the computer.
4. Explain the care and maintenance of the printer.
5. Demonstrate how to load the paper into the printer.

RESOURCES

The operation manual for the specified printer.

EVALUATION

Practical Application

Load paper into printer.

Method of Evaluation

Observation by instructor using the performance guide and the checklist. All items must be rated acceptable.

CHECKLIST: LOAD PAPER IN PRINTER

	ACTIVITY	RATING Acceptable	Unacceptable
1.	Obtained adequate supply of paper for printing job.	_____	_____
2.	Raised covers necessary to expose printer controls.	_____	_____
3.	Moved printing mechanism.	_____	_____
4.	Raised paper tractors and removed any unused paper from printer.	_____	_____
5.	Moved paper tractors to proper position.	_____	_____
6.	Engaged paper on pin feed and closed paper tractors.	_____	_____
7.	Tightened tension with right-hand paper tractors.	_____	_____
8.	Aligned paper with print mechanism using adjustment controls.	_____	_____
9.	Set carriage control tape so that print is aligned on paper, if applicable.	_____	_____
10.	Closed cover.	_____	_____
11.	Pressed start key.	_____	_____

Student's Name _____

Evaluated By _____ **Date** _____

DUTY OR UNIT: PROCESSING DATA USING COMPUTER EQUIPMENT

PERFORMANCE OBJECTIVE 9

TASK: Change ribbon in printer.

CONDITIONS: New ribbon, printer

STANDARD: Ribbon must be changed according to instructions and must produce clear, readable print.

SOURCE FOR STANDARD:
Consensus of writing team composed of incumbent computer operators

PERFORMANCE GUIDE

1. Secure ribbon and instructions for replacing ribbon.
2. Turn off printer.
3. Replace ribbon according to instructions.
4. Turn on machine and check quality of print.
5. Follow designated procedures if print quality is not acceptable.

ENABLING OBJECTIVE

Ability to follow directions

LEARNING ACTIVITIES

1. Show how to determine when a new ribbon needs to be installed.
2. Demonstrate how to remove the old ribbon cartridge.
3. Demonstrate how to install a new ribbon cartridge.
4. Show how to check to see if ribbon cartridge has been installed properly.
5. Explain what to do if ribbon quality is not acceptable.

RESOURCES

Operation manual for the specified printer.

EVALUATION

Practical Application
Change ribbon in printer.

Method of Evaluation
Observation by instructor using the performance guide and the checklist. All items must be rated acceptable.

CHECKLIST: CHANGE RIBBON IN PRINTER

	ACTIVITY	RATING Acceptable	Unacceptable
1.	Obtained ribbon and instructions for replacing ribbon.	_____	_____
2.	Turned off printer.	_____	_____
3.	Replaced ribbon according to instructions.	_____	_____
4.	Turned on machine and checked quality of print.	_____	_____
5.	Followed designated procedures if print quality was not acceptable.	_____	_____

Student's Name _____

Evaluated By _____ Date _____

DUTY OR UNIT: PERFORMING DATA CONTROL FUNCTIONS

PERFORMANCE OBJECTIVE 10

TASK: Prepare job instructions for key operator.

CONDITIONS: Source document, necessary software, data record layout, key entry specifications.

STANDARD: Job instructions must be prepared without error and must contain field locations and field definitions of items to be keyed, related data entry program control functions, and special keying instructions.

SOURCE FOR STANDARD:
Shelly and Cashman. **Introduction to Computers and Data Processing.**
129 Card Data Recorder — Operator's Reference Manual, p. 1.

PERFORMANCE GUIDE

1. Identify items on the source document that will be keyed into the data record.
2. Enter items to be keyed on the job instruction sheet showing the field locations and field definition (i.e., numeric and alphabetic).*
3. Indicate the data entry program control function that relates to each data field on the job instruction sheet.**
4. Note special keying instructions relating to data fields on job instruction sheet.

ENABLING OBJECTIVE
Ability to follow directions

LEARNING ACTIVITIES

1. Show examples of different types of source documents.
2. Explain how source documents are used in data entry.
3. Show an example of a job instruction sheet (Student Information Sheet).
4. Demonstrate how to complete a job instruction sheet.
5. Have students complete a job instruction sheet.

RESOURCES
Student Information Sheet (Job Instruction Sheet)
Bux and Clark. **Data Entry Activities for the Microcomputer,** Activity 2.
Wanous, et. al. **Fundamentals of Data Processing,** Chapter 1.

The South Carolina Curriculum Writing Team makes the following comments:
*For magnetic media, it would not be necessary to show the field locations and field definition. It is necessary to know the order for data input and the maximum number of spaces for each field.

**This is not necessary for magnetic media.

EVALUATION

Practical Application

Using a source document, prepare a job instruction sheet.

Method of Evaluation

Observation by instructor using the performances guide and the checklist. All items must be rated acceptable.

JOB INSTRUCTION SHEET

NAME OF JOB _____

SOURCE DOCUMENT _____

DATA TO BE ENTERED (in order of entry) _____

_____

_____

SPECIAL SOFTWARE TO BE USED _____

_____

SPECIAL INSTRUCTIONS _____

_____

_____

JOB COMPLETED BY _____

DATE _____

CHECKLIST: PREPARE JOB INSTRUCTIONS FOR KEY OPERATOR

	ACTIVITY	RATING Acceptable	Unacceptable
1.	Wrote name of job clearly.	_____	_____
2.	Identified source document.	_____	_____
3.	Entered all data in correct order.	_____	_____
4.	Identified special software.	_____	_____
5.	Gave special instructions.	_____	_____
6.	Gave name of person completing the job.	_____	_____
7.	Gave date.	_____	_____

Student's Name _____

Evaluated By _____ Date _____

DUTY OR UNIT: ENTERING AND VERIFYING DATA

PERFORMANCE OBJECTIVE 11

TASK: Set up work station.

CONDITIONS: Job to be entered, data entry equipment, supplies, and source materials

STANDARD: All supplies and source materials must be assembled and equipment must be ready for entering data.

SOURCE FOR STANDARD:
Consensus of writing team composed of data entry operators

PERFORMANCE GUIDE
1. Assemble supplies and source materials.
2. Organize job in correct order for entering.
3. Turn machine on.
4. Place media on data entry equipment (if applicable).
5. Set controls.

ENABLING OBJECTIVE
Ability to follow directions

LEARNING ACTIVITIES
1. Identify what should be located at work station.
2. Demonstrate how the work station should be set up.
3. Have students practice turning machine on.
4. Show how to place media on data entry equipment (if applicable.)
5. Demonstrate how to load software.

RESOURCES
Manual for machine used
Bux and Clark. **Data Entry Activities for the Microcomputer,** Activity 1.
Muscat and Lorton. **User's Guide for Microcomputer Applications for the Data Processing Work Kit.**

EVALUATION
Practical Application
Set up work station for operation with equipment ready for entering data.

Method of Evaluation
Observation by the instructor using the performance guide and the checklist. All items must be rated acceptable.

CHECKLIST: SET UP WORK STATION

	ACTIVITY	RATING Acceptable	Unacceptable
1.	Positioned CRT so the user can see screen.	_____	_____
2.	Positioned keyboard so it is accessible to user.	_____	_____
3.	Inserted software--tape, disk or card.	_____	_____
4.	Turned machine on.	_____	_____
5.	Loaded program and set controls.	_____	_____
6.	Located data to be entered so it can be read easily.	_____	_____

Student's Name _____

Evaluated By _____ **Date** _____

DUTY OR UNIT: PERFORMING DATA CONTROL FUNCTIONS

PERFORMANCE OBJECTIVE 12

TASK: Determine reason for CRT terminal not functioning.

CONDITIONS: Malfunctioning CRT terminal provided.

STANDARD: Exact cause of malfunction must be identified or appropriate vendor representative contacted.

SOURCE FOR STANDARD:
Consensus of writing team composed of data entry operators

PERFORMANCE GUIDE

1. Insure the malfunction is not due to operator error (i.e., accidental pressing of **Break** key instead of **Return**).
2. Check to see if terminal is receiving power.
3. Check to see if terminal has been disabled by the central system.
4. Turn system off and check fuse.
5. Insure that malfunction is not in modem.
6. If CRT is still malfunctioning, write description of malfunction.
7. Call vendor representative.

ENABLING OBJECTIVE

Ability to follow directions

LEARNING ACTIVITIES

1. Demonstrate how to turn on a CRT terminal.
2. Discuss types of problems that could cause a malfunction.
3. Demonstrate how to check terminal for power failure.
4. Demonstrate how to check for malfunction of modem, disk or tape drive.
5. Have students to write description of malfunction (Student Information Sheet).
6. Discuss appropriate action to follow after CRT malfunctions.

RESOURCES

Student Information Sheet (Repair Form)

EVALUATION

Practical Application
Determine the cause of CRT terminal malfunction.

Method of Evaluation
Observation by the instructor using the performance guide and the checklist. All items must be rated acceptable.

REPAIR FORM

DATE _____

NAME _____

LOCATION _____

TYPE OF MALFUNCTION _____

_____

_____

_____

REPAIR FORM

DATE _____

NAME OF MACHINE _____

LOCATION _____

TYPE OF MALFUNCTION _____

_____

_____

_____

CHECKLIST: DETERMINE REASON FOR CRT TERMINAL NOT FUNCTIONING

	ACTIVITY	RATING Acceptable	RATING Unacceptable
1.	Turned on CRT terminal.	_____	_____
2.	Checked the following items when the machine malfunctioned:		
	a. POWER	_____	_____
	b. MODEM	_____	_____
	c. DISK OR TAPE DRIVE	_____	_____
3.	Completed the repair form.	_____	_____
4.	Followed appropriate action after malfunction.	_____	_____

Student's Name _____

Evaluated By _____ Date _____

DUTY OR UNIT: ENTERING AND VERIFYING DATA

PERFORMANCE OBJECTIVE 13

TASK: Enter data from source documents (with or without program control).

CONDITIONS: Source documents, data entry format requirements, and designated data entry equipment with recording medium.

STANDARD: Data must be recorded from source documents in designated format without errors and must meet minimum keystroke standards as specified for the job.

SOURCE FOR STANDARD:
Consensus of writing team composed of data entry operators

PERFORMANCE GUIDE

Magnetic Media — Off-line (tape, disk, or diskette)

1. Start machine.
2. Place tape, disk, or diskette on data entry equipment.
3. Set machine to **Enter** mode.
4. Activate program, if using program control.
5. Key data.
6. Remove tape, disk, or diskette from machine.
7. Turn machine off.

Magnetic Media — On-line (terminal)

1. Log on.
2. Key data.
3. Log off.

Keypunch*

1. Review instructions.
2. Place blank cards in hopper.
3. Insure that starwheels are raised.
4. Mount program card on drum.
5. Lower starwheels.
6. Start machine.
7. Clear machine.
8. Feed two cards into punch station.
9. Punch first card manually.
10. Turn on switches for automatic operation.

*The South Carolina Curriculum Writing Team recommends the deletion of these procedures if keypunch equipment is not available.

11. Punch remaining cards.
12. Remove punched cards from machine.
13. Remove blank cards from machine.
14. Raise starwheels.
15. Remove program card.
16. Stop machine.

ENABLING OBJECTIVE

Ability to follow directions

LEARNING ACTIVITIES

1. Review how to turn machine on and how to load tape, disk, or diskette.
2. Demonstrate how to load program in machine.
3. Explain and demonstrate how to key data.
4. Show how to remove tape, disk, or diskette and how to turn machine off.
5. Have students practice entering data.

RESOURCES

Bux and Clark. **Data Entry Activities for the Microcomputer**, pp. 29-45.
Muscat and Lorton. **User's Guide for Microcomputer Applications for the Data Processing Work Kit.**

EVALUATION

Practical Application

Enter data from source documents.

Method of Evaluation

Observation by the instructor using the performance guide and the checklist. All items must be rated acceptable.

CHECKLIST: ENTER DATA FROM SOURCE DOCUMENTS (WITH OR WITHOUT PROGRAM CONTROL)

	ACTIVITY	RATING Acceptable	Unacceptable
1.	Turned on machine and loaded with tape, disk, or diskette.	_____	_____
2.	Loaded program.	_____	_____
3.	Keyed data from source document.	_____	_____
4.	Removed tape, disk, or diskette.	_____	_____

Student's Name _____

Evaluated By _____ Date _____

DUTY OR UNIT: ENTERING AND VERIFYING DATA

PERFORMANCE OBJECTIVE 14

TASK: Add new records.

CONDITIONS: Existing file, new records to be added

STANDARD: The addition and accuracy of all new records must be completed without error.

SOURCE FOR STANDARD:
Wanous, Wagner, and Hallan. **Introduction to Automated Data Processing,** p. 56.

PERFORMANCE GUIDE

Magnetic Media — (tape, disk, diskette)

1. Locate file to which new records are to be added.
2. Place machine in **Enter** mode.
3. Key data for new records.
4. Verify accuracy of added records.

Keypunch*

1. Keypunch new records.
2. Verify records.
3. Insert new record into existing deck, either manually or through sort.

ENABLING OBJECTIVE
Ability to follow directions

LEARNING ACTIVITIES

1. Demonstrate how to load software.
2. Discuss how to add records to old file.
3. Explain and show how to key data for new records.
4. Have students practice keying data for new records.
5. Have students to check records for accuracy.

RESOURCES
Bux and Clark. **Data Entry Activities for the Microcomputer,** Activity 11.
Olinzock and Santos. **Microcomputer Activities for Office Procedures,** Activity 4.

EVALUATION

Practical Application
Add new records on tape, disk, diskette, or keypunch.

Method of Evaluation
Use performance guide and checklist to determine student's proficiency in adding new records. All items must be rated acceptable.

*The South Carolina Curriculum Writing Team recommends the deletion of these procedures if keypunch equipment is not available.

CHECKLIST: ADD NEW RECORDS

	ACTIVITY	RATING Acceptable	Unacceptable
1.	Loaded software into computer.	_____	_____
2.	Keyed data into existing file.	_____	_____
3.	Verified and corrected records, if necessary.	_____	_____
4.	Removed software from computer and turned off power.	_____	_____

Student's Name _____

Evaluated By _____ Date _____

DUTY OR UNIT: ENTERING AND VERIFYING DATA

PERFORMANCE OBJECTIVE 15

TASK: Modify records.

CONDITIONS: Existing records, instructions for modification, data

STANDARD: Modified records must contain no errors.

SOURCE FOR STANDARD:
Wanous, Wagner, and Hellan. **Introduction to Automated Data Processing,** p. 56.

PERFORMANCE GUIDE
1. Locate record to be modified.
2. Key required changes.
3. Verify accuracy of modified record.

ENABLING OBJECTIVE
Ability to follow directions

LEARNING ACTIVITIES
1. Discuss steps necessary to modify records.
2. Demonstrate how to load software.
3. Explain how to locate record to be modified.
4. Have students key in changes by following instructions on software.
5. Have students verify changes before storing data.

RESOURCES
Olinzock and Santos. **Microcomputer Activities for Office Procedures,** Activities 4-10.
Bux and Clark. **Data Entry Activities for the Microcomputer,** Activity 2.

EVALUATION
Practical Application
Using data provided by the instructor, modify the records.

Method of Evaluation
Use performance guide and checklist to determine student's proficiency in modifying records. All items on checklist must be rated acceptable.

CHECKLIST: MODIFY RECORDS

	ACTIVITY	RATING Acceptable	Unacceptable
1.	Loaded software.	_____	_____
2.	Located record to be changed or modified.	_____	_____
3.	Keyed in corrections.	_____	_____
4.	Verified corrections before storing.	_____	_____
5.	Removed software from computer and turned power off.	_____	_____

Student's Name _____

Evaluated By _____ Date _____

DUTY OR UNIT: ENTERING AND VERIFYING DATA

PERFORMANCE OBJECTIVE 16

TASK: Correct data entry errors.

CONDITIONS: Media on which incorrect data have been recorded, location of errors, corrections to be made

STANDARD: All data entry errors must be corrected and verified.

SOURCE FOR STANDARD:
Wanous, Wagner, and Hallan. **Introduction to Automated Data Processing,** p. 60.

PERFORMANCE GUIDE

Magnetic Media — Off-line and On-line

1. Locate file containing incorrect data.
2. Place machine in designated mode.
3. Locate errors.
4. Make corrections.
5. Verify corrections.

Keypunch*

1. Manually insert card containing error at read station and blank card at punch station.
2. Duplicate the columns of the card that are correct and repunch the incorrect columns.
3. Put a tear in error card and place behind keyboard.
4. Repeat Steps 1-3 until all corrections have been made.
5. Sight check cards for accuracy.
6. Verify accuracy of corrections.

ENABLING OBJECTIVE
Ability to follow directions

*The South Carolina Curriculum Writing Team recommends the deletion of this procedure if keypunch equipment is not available.

LEARNING ACTIVITIES

1. Discuss procedures to follow in correcting errors.
2. Demonstrate how to load software.
3. Explain how to locate file containing incorrect data.
4. Show how to locate errors.
5. Have students practice making corrections and verifying corrections.

RESOURCES

Olinzock and Santos. **Microcomputer Activities for Office Procedures,** Activities 4-10.

Bux and Clark. **Data Entry Activities for the Microcomputer,** Activity 2.

EVALUATION

Practical Application

Correct data entry errors.

Method of Evaluation

Observation by the instructor using the performance guide and the checklist. All items must be rated acceptable.

CHECKLIST: CORRECT DATA ENTRY ERRORS

	ACTIVITY	RATING Acceptable	Unacceptable
1.	Loaded software.	_____	_____
2.	Located error in record.	_____	_____
3.	Made all corrections and verified before storing.	_____	_____
4.	Removed software and turned power off.	_____	_____

Student's Name _____

Evaluated By _____ Date _____

DUTY OR UNIT: PERFORMING DATA CONTROL FUNCTIONS

PERFORMANCE OBJECTIVE 17

TASK: Recover data after incorrectly removing tape or diskette.

CONDITIONS: Incorrectly removed tape or diskette

STANDARD: All keyed data must be recovered.

SOURCE FOR STANDARD:
Concensus of writing team composed of incumbent data entry operators

PERFORMANCE GUIDE
1. Insert tape or diskette into keying device.
2. Locate point at which data was lost.
3. Locate same point in source documents.
4. Rekey lost data.
5. Verify data.

ENABLING OBJECTIVE
Ability to follow directions

LEARNING ACTIVITIES
1. Explain causes for data being lost, i.e., power failure, power surges, mechanical failure.
2. Discuss steps necessary to recover lost data.
3. Demonstrate how to insert software.
4. Explain how to locate point at which data was lost.
5. Explain the process of rekeying lost data and verification.
6. Reemphasize the importance of saving all work.
7. Have students practice rekeying lost data.

RESOURCES
Bux and Clark. **Data Entry Activities for the Microcomputer.**

EVALUATION
Practical Application
Recover data after incorrectly removing tape or diskette.

Method of Evaluation
Observation by the instructor using the performance guide and the checklist. All items must be rated acceptable.

CHECKLIST: RECOVER DATA AFTER INCORRECTLY REMOVING TAPE OR DISKETTE

	ACTIVITY	RATING Acceptable	Unacceptable
1.	Loaded software.	_____	_____
2.	Located point at which data was lost.	_____	_____
3.	Rekeyed lost data.	_____	_____
4.	Verified data.	_____	_____
5.	Saved data.	_____	_____
6.	Removed software and turned power off.	_____	_____

Student's Name _____

Evaluated By _____ Date _____

DUTY OR UNIT: PERFORMING RELATED MACHINE OPERATIONS

PERFORMANCE OBJECTIVE 18

TASK: Prepare printouts using printer.

CONDITIONS: Printer, punched cards or computer file, and form specifications

STANDARD: Printouts must have clear print and must be aligned according to form specifications.

SOURCE FOR STANDARD:
Consensus of writing team composed of data entry operators

PERFORMANCE GUIDE

1. Secure forms.
2. Set up printer for forms.
3. Mount forms on printer.
4. Start printer to align forms.
5. Adjust alignment as needed.
6. Check printing for clarity.
7. If printing is not clear, clean printer, replace ribbon, or make other needed adjustments.
8. Print forms.

ENABLING OBJECTIVE
Ability to follow directions

LEARNING ACTIVITIES

1. Discuss the importance of clear, readable output and show good and poor examples.
2. Show how to set up printer for particular forms.
3. Demonstrate how to mount forms on printer.
4. Explain how to start printer and adjust alignment as needed.
5. Demonstrate how to clean printer, replace ribbon or make other needed adjustments for particular output problems.
6. Show results of adjustments through printer output.

RESOURCES
Vendor's computer operating manual for printer

EVALUATION

Practical Application
Prepare printouts using printer.

Method of Evaluation
Observation by the instructor using the performance guide and the checklist. All items must be rated acceptable.

Performance Objective 18

Data Entry Operator
V-TECS 24

CHECKLIST: PREPARE PRINTOUTS USING PRINTER

	ACTIVITY	RATING Acceptable	Unacceptable
1.	Loaded and aligned forms.	_____	_____
2.	Adjusted alignment and checked printing clarity.	_____	_____
3.	Demonstrated how to clean printer.	_____	_____
4.	Demonstrated how to replace printer ribbon.	_____	_____
5.	Demonstrated how to make other adjustments if necessary.	_____	_____
6.	Outputted clear, readable forms.	_____	_____

Student's Name _____

Evaluated By _____ Date _____

DUTY OR UNIT: ENTERING AND VERIFYING DATA

PERFORMANCE OBJECTIVE 19

TASK: Terminate operation. *

CONDITIONS: Machine with disks, diskettes, tapes, or cards

STANDARD: Operation is terminated when disks, diskettes, tapes, or cards are removed from machine and stored according to vendor's operating manual, source documents are marked, and machines are turned off.

SOURCE FOR STANDARD:
Consensus of writing team composed of data entry operators

PERFORMANCE GUIDE

Magnetic Media — Off-line (tape, disk, diskette)

1. Place machine in **Rewind** mode.
2. Remove media (tape, disk, diskette) and store.
3. Mark source documents and stack neatly.
4. Turn machine off.

Magnetic Media — On-line (terminal)

1. Enter **Save** to hold the incomplete batch for the next processing day.
2. Mark source documents and stack neatly.
3. Log off.

Keypunch*

1. Remove punched cards from machine and file.
2. Remove blank cards from machine and store.
3. Dispose of error cards.
4. Mark source documents and stack neatly.
5. Turn machine off.

ENABLING OBJECTIVE
Ability to follow directions

LEARNING ACTIVITIES

1. Explain how to terminate processing according to software instructions.
2. Demonstrate how to remove media (tape, disk, diskette) and turn off machine according to vendor's operating manual.
3. Show students the designated storage place for removed media.
4. Explain how to mark and store source documents.
5. Review how to turn machine off.

*The South Carolina Curriculum Writing Team recommends the deletion of these steps if keypunch equipment is not available.

RESOURCES

Vendor's (computer) Operating Manual
Appropriate software packages

EVALUATION

Practical Application

Terminate an operation.

Method of Evaluation

Observation by the instructor using the performance guide and checklist. All items must be rated acceptable.

CHECKLIST: TERMINATE OPERATION

	ACTIVITY	RATING Acceptable	Unacceptable
1.	Followed software directions for terminating program.	_____	_____
2.	Removed media.	_____	_____
3.	Turned off machine.	_____	_____
4.	Placed removed media in designated storage place.	_____	_____
5.	Marked and stored source documents.	_____	_____

Student's Name _____

Evaluated By _____ Date _____

DUTY OR UNIT: PERFORMING CLERICAL AND MAINTENANCE DUTIES

PERFORMANCE OBJECTIVE 20

TASK: File reusable tapes, disks, or diskettes.

CONDITIONS: Reusable tapes, disks, or diskettes to be filed

STANDARD: Tapes, disks, or diskettes must be filed as designated with 100 percent accuracy.

SOURCE FOR STANDARD:
Shelly and Cashman. **Introduction to Computers and Data Processing,** pp. 1-15.

PERFORMANCE GUIDE
1. Collect tapes, disks, or diskettes.
2. Sort tapes, disks, or diskettes.
3. File tapes, disks, or diskettes.

ENABLING OBJECTIVE
Ability to follow directions

LEARNING ACTIVITIES
1. Demonstrate how to collect tapes, disks, or diskettes.
2. Demonstrate how to clean tapes and disks of foreign dust particles.
3. Explain the designated categories and order (ascending, etc.) used in sorting and filing tapes, disks, or diskettes.
4. Demonstrate how to file tapes, disks, or diskettes by appropriate categories and by correct order into storage areas.
5. Explain the importance of placing tapes, disks, or diskettes in fireproof storage areas and having more than one tape library.

RESOURCES
None available to the writing team

EVALUATION
Practical Application
File reusable tapes, disks, or diskettes.

Method of Evaluation
Observation by the instructor using performance guide and checklist. All items must be rated acceptable.

CHECKLIST: FILE REUSABLE TAPES, DISKS, OR DISKETTES

	ACTIVITY	RATING Acceptable	Unacceptable
1.	Collected tapes, disks, or diskettes.	_____	_____
2.	Arranged tapes, disks, or diskettes by category and order.	_____	_____
3.	Filed tapes, disks, or diskettes.	_____	_____

Student's Name _____

Evaluated By _____ Date _____

DUTY OR UNIT: ANALYZING PROGRAMMING PROBLEMS

PERFORMANCE OBJECTIVE 21

TASK: Design I/O record layouts.

CONDITIONS: Job specifications, identified I/O devices, appropriate layout forms

STANDARD: The I/O record layouts must be designed according to job specifications.

SOURCE FOR STANDARD:
Georgia Writing Team. Consensus of Georgia writing team composed of programming educators and incumbent workers.

PERFORMANCE GUIDE
1. Select form for I/O device such as card, disk and tape.
2. Label record layout.
3. Define record content by drawing data fields on form.
4. Label all data fields.
5. Indicate data format of each field as to alpha, alphanumeric, numeric or constant/literal data.

ENABLING OBJECTIVE
Ability to follow directions

LEARNING ACTIVITIES
1. Discuss the reasons for designing I/O record layouts, i.e., as closely to job specifications as possible.
2. Discuss the different I/O devices available (such as card, disk, tape) and show examples of the various I/O record forms for each.
3. Demonstrate how to appropriately label I/O record layout forms for selected I/O device.
4. Show how to define record content by drawing data fields on layout form, and how to label all data fields.
5. Discuss and define data format choices of each field as to alpha, alphanumeric, numeric or constant/literal data.
6. Demonstrate how to indicate choices of each field on I/O record layout form.

RESOURCES
Shelly and Cashman. **Introduction to Computers and Data Processing,** Chapters 3 and 7.
Vendor's Reference of Procedures Manual (I/O Record Layout Section)
Wanous, et. al. **Fundamentals of Data Processing,** Chapters 5 and 8.

EVALUATION

Practical Application
Design I/O record layouts.

Method of Evaluation
Observation by the instructor using the performance guide and checklist. All items must be rated acceptable.

CHECKLIST: DESIGN I/O RECORD LAYOUTS

	ACTIVITY	RATING Acceptable	RATING Unacceptable
1.	Listed 3 reasons for designing I/O record layouts as closely to job specifications as possible.	_____	_____
2.	Identified the various I/O record layout forms.	_____	_____
3.	Demonstrated how to label I/O record content by drawing data fields on I/O record layout form.	_____	_____
4.	Labeled all data fields.	_____	_____
5.	Indicated appropriate data format choices on I/O record layout form.	_____	_____

Student's Name _____

Evaluated By _____ Date _____

DUTY OR UNIT: FLOWCHARTING SOLUTIONS TO PROGRAMMING PROBLEMS

PERFORMANCE OBJECTIVE 22

TASK: Program logic: Develop general logic sequence.

CONDITIONS: Job specifications, I/O record layouts, flowcharting sheets, flowcharting template

STANDARD: The flowchart must reflect an analysis of the problem, contain sufficient labeling to be readable, and use standard flowcharting symbols.

SOURCE FOR STANDARD:

American National Standards Institute, **X3.5-1970 Flowchart Symbols and Their Use in Information Processing (FIPS24)(DOD).**

Yoke. "An Overview of Programming Practices." **ACM Computing Surveys,** pp. 229-230.

PERFORMANCE GUIDE

1. Define input data routines.
   a. Read files.
   b. Select records to be processed.
2. Define data manipulation routines.
   a. Edit data
   b. Sort files
   c. Construct intermediate work files.
   d. Accumulate totals.
3. Define output data routines.
   a. Construct output records.
   b. Write output records.
4. Draw general flowchart.

ENABLING OBJECTIVE(S)

Ability to follow directions and to make simple, logical decisions.

LEARNING ACTIVITIES

1. Explain how important job specifications are in developing and flowcharting a logic sequence.
2. Emphasize the importance of I/0 record layouts in developing and flowcharting logic sequence.
3. Discuss and define the purpose of each symbol on the standard flowcharting template.
4. Show how a logic sequence must reflect an analysis of the problem by giving good and poor examples of each.
5. List the reasons a flowcharted logic sequence must contain sufficient labeling to be readable and must have the standard flowcharting symbols.

6. Explain how to define input data routines by reading files and selecting records to be processed.
7. Discuss how to define data manipulation routines that will edit data, sort files, construct intermediate work files, and accumulate totals.
8. Demonstrate how to define output data routines that construct output records and write output records.
9. Show how to develop a general logic sequence using flowcharting sheets and standard flowcharting symbols.

RESOURCES

Shelly and Cashman. **Introduction to Computers and Data Processing,** Chapter 11.

Shelly and Cashman. **Introduction to Flowcharting and Computer Programming Logic,** Chapters 6-12.

McQuigg and Harness. **Flowcharting.**

EVALUATION

Practical Application

Develop a logic sequence for a program design.

Method of Evaluation

Observation by the instructor using performance guide and checklist. All items must be rated acceptable.

Performance Objective 22

Programmer
V-TECS 16

CHECKLIST: PROGRAM LOGIC: DEVELOP GENERAL LOGIC SEQUENCE

ACTIVITY	RATING	
	Acceptable	Unacceptable
Checked flowchart which contained the following:		
1. Standard flowcharting symbols	_____	_____
2. An analysis of the problem	_____	_____
3. Sufficient labeling to be readable	_____	_____
4. Input data routines	_____	_____
5. Data manipulation routines	_____	_____
6. Output data routines	_____	_____

Student's Name _____

Evaluated By _____ Date _____

DUTY OR UNIT: FLOWCHARTING SOLUTIONS TO PROGRAMMING PROBLEMS

PERFORMANCE OBJECTIVE 23

TASK: Prepare detail flowchart for coding program.

CONDITIONS: Program specifications, program (general) flowchart, I/O record layouts, flowcharting sheets, flowcharting template

STANDARD: The flowchart must reflect logic sequence to accommodate program specifications, contain sufficient labeling to be readable, and use standard flowchart symbols.

SOURCE FOR STANDARD:

American National Standards Institute. **X3.5-1970 Flowchart Symbols and Their Use in Information Processing (FIPS24) (DOD).**

Yoke. "An Overview of Programming Practices." **ACM Computing Surveys,** pp. 229-230.

Georgia Writing Team. Consensus of Georgia writing team composed of programming educators and incumbent workers.

PERFORMANCE GUIDE

1. Review program specifications.
2. Verify program (general) flowchart.
3. Develop detailed logic steps for each routine.
5. Construct flowchart of detailed instructions.

ENABLING OBJECTIVE(S)

Ability to follow directions and to make simple, logical decisions.

LEARNING ACTIVITIES

1. Discuss the importance of the program specifications given by the systems analyst.
2. Explain how to check and verify a program (general) flowchart.
3. Give examples of how to develop the detailed logic steps for each routine.
4. Explain and show how to construct a flowchart of detailed instructions with readable labeling and standard flowchart symbols.
5. Have students construct a general flowchart.

RESOURCES

Shelly and Cashman. **Introduction to Computers and Data Processing,** Chapters 10 and 11.

Shelly and Cashman. **Introduction to Flowcharting and Computer Programming Logic,** Chapters 1, 2, and 3.

EVALUATION

Practical Application

Prepare a detail flowchart for coding a program.

Method of Evaluation

Observation by the instructor using performance guide and checklist. All items must be rated acceptable.

CHECKLIST: PREPARE DETAIL FLOWCHART FOR CODING PROGRAM

ACTIVITY	RATING	
	Acceptable	Unacceptable
The program flowchart contained the following:		
1. Logical sequence of program specifications	_____	_____
2. Sufficient labeling to be readable	_____	_____
3. Standard flowchart symbols	_____	_____
4. Detailed logical steps for each routine	_____	_____

Student's Name _____

Evaluated By _____ Date _____

DUTY OR UNIT: FLOWCHARTING SOLUTIONS TO PROGRAMMING PROBLEMS

PERFORMANCE OBJECTIVE 24

TASK: Prepare system flowchart.

CONDITIONS: User's specifications, flowcharting sheets, flowcharting template

STANDARD: The flowchart must reflect logical sequence of processing, contain sufficient labeling to be readable, and use standard flowchart symbols.

SOURCE FOR STANDARD:

American National Standards Institute: **X3.5-1970 Flowchart Symbols and Their Use in Information Processing (FIPS24) (DOD).**

Georgia Writing Team. Consensus of Georgia writing team composed of programming educators and incumbent workers.

Yoke. "An Overview of Programming Practices." **ACM Computing Surveys,** pp. 229-230.

PERFORMANCE GUIDE

1. Identify user's requirements in terms of specific system objectives.
2. Identify I/O hardware requirements for each run.
3. Flowchart each run, connecting inputs and outputs with receiving or sending run.

ENABLING OBJECTIVE(S)

Ability to follow directions and to make simple, logical decisions.

LEARNING ACTIVITIES

1. Explain the importance of meeting user's requirements.
2. Give examples of user's requirements that match specific system objectives.
3. Discuss how to identify I/O hardware requirements for each run.
4. Explain standard flowchart symbols used in systems flowcharts.
5. Show students how to prepare systems flowchart.

RESOURCES

Shelly and Cashman. **Introduction to Computers and Data Processing,** Chapter 10.

EVALUATION

Practical Application

Diagram a system flowchart according to user's specifications.

Method of Evaluation

Observation by the instructor using performance guide and checklist. All items must be rated acceptable.

Performance Objective 24

Programmer
V-TECS 19

CHECKLIST: PREPARE SYSTEM FLOWCHART

ACTIVITY	RATING Acceptable	Unacceptable
Diagrammed a system flowchart which contained the following.		
1. Logical sequence of processing	_____	_____
2. Sufficient labeling to be readable	_____	_____
3. Standard flowcharting symbols	_____	_____

Student's Name _____

Evaluated By _____ Date _____

DUTY OR UNIT: CODING PROGRAMS

PERFORMANCE OBJECTIVE 25

TASK: Code applications program.

CONDITIONS: Program specifications, data record layouts, programming reference manuals, detail flowchart, coding sheets

STANDARD: Coding must conform to procedures established for the use of that language and make rational use of available data and analytical methods.

SOURCE FOR STANDARD

Language/Coding Specifications.

ANSI. **X3.9-1966 BASIC FORTRAN.**

X3.23-1974 Programming Language COBOL.

X3.37-1974 Programming Language APT.

Manufacturer's/Software Distributors Specifications

Johnson. **System Structure and Data, Programs, and Computers,** p. 279.

PERFORMANCE GUIDE

1. Review program specifications.
2. Verify detail flowchart.
3. Code applications program.
4. Verify coding.

ENABLING OBJECTIVE(S)

Ability to follow directions and to make simple, logical decisions.

LEARNING ACTIVITIES

1. Review the importance of program specifications.
2. Explain how to check and verify a detail flowchart.
3. Give examples of coding for the language used.
4. Explain how to use data and analytical methods.
5. Show examples of good and bad coded applications programs.
6. Explain how to verify coded applications program.

RESOURCES

Shelly and Cashman. **Introduction to Computers and Data Processing,** Appendix A.

EVALUATION

Practical Application

Code an application program.

Method of Evaluation

Observation by the instructor using the performance guide and checklist. All items must be rated acceptable.

Performance Objective 25

Programmer
V-TECS 21

CHECKLIST: CODE APPLICATIONS PROGRAM

ACTIVITY	RATING	
	Acceptable	Unacceptable
Coded an application program which included the following:		
1. Reflected program specifications.	_____	_____
2. Reflected the detail flowchart.	_____	_____
3. Conformed to procedures of language used.	_____	_____
4. Made use of data and analytical methods.	_____	_____

Student's Name _____

Evaluated By _____ Date _____

DUTY OR UNIT: TESTING PROGRAMS

PERFORMANCE OBJECTIVE 26

TASK: Develop data for use in program testing.

CONDITIONS: Program specifications provided

STANDARD: The data must contain the conditions necessary to test for both normal and unusual results.

SOURCE FOR STANDARD:
Van Ness. **Principles of Data Processing With Computers,** p. 79,
Walnut. **Introduction to Computer Programming and Coding,** p. 84.

PERFORMANCE GUIDE
1. Review program specifications.
2. Determine normal and unusual conditions to be tested.
3. Create data to test each condition.

ENABLING OBJECTIVE(S)
Ability to follow directions and possess analytical skills

LEARNING ACTIVITIES
1. Explain the necessity of including abnormal data when testing a program.
2. Walk through sample programs using normal and unusual data.
3. Discuss features and techniques of language which check for abnormal results.
4. Have student enter and run a program with valid and invalid data.
5. Have student create data for use in program testing.

RESOURCES
Clark and Drum. **Structured BASIC,** Chapter 5.
Shelly and Cashman. **Introduction to Computer Programming, Structured COBOL,** Chapter 2.

EVALUATION
Practical Application
A problem statement and coded program should be supplied by the instructor. List the conditions which must be checked for each field and develop data which tests each condition.

Method of Evaluation
Observation by the instructor using the performance guide and checklist. All items must be rated acceptable.

Performance Objective 26

Programmer
V-TECS 32

CHECKLIST: DEVELOP DATA FOR USE IN PROGRAM TESTING

	ACTIVITY	RATING Acceptable	Unacceptable
1.	Listed each field and the conditions for which it was tested.	_____	_____
2.	Created data testing for normal results.	_____	_____
3.	Created data testing for unusual results.	_____	_____

Student's Name _____

Evaluated By _____ Date _____

DUTY OR UNIT: TESTING PROGRAMS

PERFORMANCE OBJECTIVE 27

TASK: Analyze computer input for test run.

CONDITIONS: Program specifications, established test data

STANDARD: The test data must be judged with regard to normal/unusual results and confirmed by the instructor.

SOURCE FOR STANDARD:

Consensus of Georgia Writing Team composed of programming educators and incumbent workers.

Walnut. **Introduction to Computer Programming and Coding,** p. 84.

PERFORMANCE GUIDE

1. Review program specifications.
2. Determine normal and unusual conditions to be tested.
3. Review test data for completeness and accuracy.
4. Note any discrepancies.

ENABLING OBJECTIVE(S)

Ability to follow directions and possess analytical skills

LEARNING ACTIVITIES

1. Have students review program specifications.
2. Explain the necessity of including abnormal data when testing a program.
3. Walk through sample programs using normal and unusual data.
4. Discuss features and techniques of language which check for abnormal results.
5. Have student enter and run a program with valid and invalid data.

RESOURCES

Clark and Drum. **Structured BASIC,** Chapter 5.

Shelly and Cashman. **Introduction to Computer Programming, Structured COBOL,** Chapter 2.

EVALUATION

Practical Application

Use the attached problem statement, coded BASIC program, test data, and worksheet. For each item of data on the worksheet, indicate if the item checks for normal results or unusual results. Also indicate if there is a need for any additional data to test for other conditions.

Method of Evaluation

Student worksheet must be completed with 100 percent accuracy. Key to the problem statement is attached.

SAMPLE PROGRAM

Problem Statement

This program is used to calculate simple interest on a loan and to calculate monthly payments necessary to repay the loan in one year's time. All loans must be between $100 and $1000 inclusive. The interest charges must be at least 15% but not more than 21%. The output for each set of data will be the following.

> The monthly payment on a $####.## loan at ##.##% interest will be $###.##.

Code

The code and sample data follow. On the chart on the next page, tell whether each data item tests for normal or unusual results. Also list any condition that is not tested.

```
90 CLS
100 INPUT "ENTER THE LOAN AMOUNT";A
110 IF A>1000 then print "AMOUNT MUST NOT EXCEED $1,000": GOTO 100
120 IF A<100 THEN PRINT "AMOUNT MUST BE AT LEAST $100":GOTO 100
130 INPUT "ENTER THE INTEREST RATE";R
140 IF R>21 THEN PRINT "INTEREST RATE MUST NOT BE MORE THAN 21%":GOTO
    130
150 IF R<15 THEN PRINT "INTEREST RATE MUST BE AT LEAST 15%:GOTO 130
160 I = A * R / 100
170 T = I + A
180 P = T / 12
190 PRINT USING "THE MONTHLY PAYMENT ON A $## #.## LOAN AT ##.##%
    INTEREST WILL BE $###.##";A,R,P
200 GOTO 100
```

Data

Use the following values for data.

Amount	Interest Rate
150	15
2000	.15
400	22
50	18
600	21

Performance Objective 27

Programmer
V-TECS 27

STUDENT WORKSHEET

Directions

For each of the data values listed below, place a checkmark to indicate if the item tests a normal condition or an unusual condition. At the bottom, list any condition which is not tested supplying the item and giving possible values, if applicable.

DATA VALUES		NORMAL	UNUSUAL
Amount	150		
	2000		
	400		
	50		
	600		
Interest Rate	15		
	.15		
	22		
	18		
	21		

Conditions not tested	Item (Amount or Interest Rate)	Possible Value
1.		
2.		

Performance Objective 27

Programmer
V-TECS 27
KEY

STUDENT WORKSHEET

Directions

For each of the data values listed below, place a checkmark to indicate if the item tests a normal condition or an unusual condition. At the bottom, list any condition which is not tested supplying the item and giving possible values, if applicable.

DATA VALUES		NORMAL	UNUSUAL
Amount	150	✓	
	2000		✓
	400	✓	
	50		✓
	600	✓	
Interest Rate	15	✓	
	.15		✓
	22		✓
	18	✓	
	21	✓	

Conditions not tested	Item (Amount or Interest Rate)	Possible Value
1. N/A		
2.		

DUTY OR UNIT: TESTING PROGRAMS

PERFORMANCE OBJECTIVE 28

TASK: Analyze computer output for accuracy following test run.

CONDITIONS: All outputs, all inputs, program specifications, established test conditions and results

STANDARD: The test results must be compatible with the established results for test run to be considered acceptable.

SOURCE FOR STANDARD:
Meek. **Glossary of Computing Terminology,** p. 160.
Van Ness. **Principles of Data Processing With Computers,** p. 80.

PERFORMANCE GUIDE
1. Review program specifications and established test conditions.
2. Determine if all expected output has been produced.
3. Verify output formats.
4. Verify output content for accuracy.
5. Verify that all established test conditions have been met.

ENABLING OBJECTIVE(S)
Ability to follow directions and the possession of analytical skills.

LEARNING ACTIVITIES
1. Discuss how information is printed on microcomputer screens using zone formats.
2. Explain editing characters and how they can be included on reports.
3. Discuss importance of neatness and readability of output.
4. Emphasize the importance of analyzing output data for accuracy and completeness.
5. Give examples of test runs and have students analyze the output and suggest improvements.

RESOURCES
Clark and Drum. **Structured BASIC,** Chapter 4.

EVALUATION
Practical Application
Analyze computer output (provided by the instructor) for accuracy following test runs. Complete Student Worksheet and submit to instructor.

Method of Evaluation
Instructor will determine from the worksheet if the output was analyzed correctly by the student.

STUDENT WORKSHEET

Analyzing Computer Output

	Item	Yes	No
1.	Spacing of each line of output in accordance with the established results?		
2.	Editing accurate on every item?		
3.	Heading conforms exactly to the established results?		
4.	All calculated values correspond to the established results?		
5.	If an interactive program, does the program test data input for validity at all appropriate points?		

Student's Name _____

Evaluated By _____ Date _____

DUTY OR UNIT: DOCUMENTING PROGRAMS

PERFORMANCE OBJECTIVE 29

TASK: Develop documentation narrative.

CONDITIONS: Record layout(s), program (general) flowchart, program specifications

STANDARD: The narrative must describe the problem statement clearly and in such a way that all requirements involved are covered.

SOURCE FOR STANDARD:
Georgia Writing Team. Consensus of Georgia writing team composed of programming educators and incumbent workers.

PERFORMANCE GUIDE
1. Review program specifications.
2. Explain program specifications.
   a. State purpose of program.
   b. List required input.
   c. Explain processing techniques.
   d. Describe output and disposition.

ENABLING OBJECTIVE
Ability to follow directions.

LEARNING ACTIVITIES
1. Discuss the reasons for documentation of computer programs.
2. List items that may be included as part of the documentation.
3. Distinguish between documentation required for command-driven programs vs. prompt-driven programs.
4. Discuss how structured programs are vitually self-documenting.
5. Discuss the use of remark/comment statements in programs.
6. Distinguish between internal and external documentation.
7. Give examples of documentation narratives and discuss.

RESOURCES
Gilbert and Larky. **Practical PASCAL,** pp. 124-127.
Shelly and Cashman. **Introduction to BASIC Programming,** Chapters 1 and 2.

EVALUATION
Practical Application
Write a documentation narrative for the program specifications provided by the instructor.

Method of Evaluation
Evaluate the narrative using the attached checklist. All items must be rated acceptable.

CHECKLIST: DOCUMENTING PROGRAMS

ACTIVITY	RATING	
	Acceptable	Unacceptable
The narrative supplied each of the following:		
1. Purpose of the program	_____	_____
2. Explanation of how to begin execution of the program	_____	_____
3. Description of format in which each data item must be entered	_____	_____
4. Explanation of the processing techniques	_____	_____
5. Description of the output to be produced	_____	_____
6. Explanation of how to terminate execution of the program	_____	_____
7. Explanation of the disposition of any printout produced	_____	_____

Student's Name _____

Evaluated By _____ Date _____

APPENDIX A

DUTY AND TASK LIST

		V-TECS P.O. #	Page Number
PERFORMING SUPERVISORY FUNCTIONS			
1.	Develop job descriptions.	CO-7	5
PROCESSING DATA USING COMPUTER EQUIPMENT			
2.	Perform power-on procedures.	CO-25	8
3.	Perform power-off procedures.	CO-26	10
4.	Load the operating system.	CO-49	12
5.	Load programs, files, or data base.	CO-33	14
6.	Run tests on programs.	CO-40	17
PERFORMING DATA CONTROL FUNCTIONS			
7.	Copy data.	DEO-6	19
PROCESSING DATA USING COMPUTER EQUIPMENT			
8.	Load paper in printer.	CO-47	22
9.	Change ribbon in printer.	CO-48	25
PERFORMING DATA CONTROL FUNCTIONS			
10.	Prepare job instructions for key operator.	DEO-2	27
ENTERING AND VERIFYING DATA			
11.	Set up work station.	DEO-12	31
PERFORMING DATA CONTROL FUNCTIONS			
12.	Determine reason for CRT terminal not functioning.	DEO-4	33
ENTERING AND VERIFYING DATA			
13.	Enter data from source documents (with or without program control).	DEO-14	36
14.	Add new records.	DEO-16	39
15.	Modify records.	DEO-17	41
16.	Correct data entry errors.	DEO-18	43
PERFORMING DATA CONTROL FUNCTIONS			
17.	Recover data after incorrectly removing tape or diskette.	DEO-9	46
PERFORMING RELATED MACHINE OPERATIONS			
18.	Prepare printouts using printer.	DEO-24	48

CO = Computer Operator
DEO = Data Entry Operator
P = Programmer

DUTY AND TASK LIST (con't)

		V-TECS P.O. #	Page Number
ENTERING AND VERIFYING DATA			
19.	Terminate operation.	DEO-21	50
PERFORMING CLERICAL AND MAINTENANCE DUTIES			
20.	File reusable tapes, disks, or diskettes.	DEO-35	53
ANALYZING PROGRAMMING PROBLEMS			
21.	Design I/O record layouts.	P-13	55
FLOWCHARTING SOLUTIONS TO PROGRAMMING PROBLEMS			
22.	Program logic: Develop general logic sequence.	P-16	58
23.	Prepare detail flowchart for coding program.	P-17	61
24.	Prepare system flowchart.	P-19	63
CODING PROGRAMS			
25.	Code applications program.	P-21	65
TESTING PROGRAMS			
26.	Develop data for use in program testing.	P-32	67
27.	Analyze computer input for test run.	P-27	69
28.	Analyze computer output for accuracy following test run.	P-28	73
DOCUMENTING PROGRAMS			
29.	Develop documentation narrative.	P-38	75

DEO = Data Entry Operator
P = Programmer

APPENDIX B

DEFINITION OF TERMS

The following items are supplied to establish operational definitions as they apply to this study.

CAREER LADDER: A vertical arrangement of jobs within an occupational area to indicate skill distinction and progression.

CATALOGS: A comprehensive collection of performance objectives, performance guides, criterion-referenced measures, and related data organized by a job structure or career ladder within a domain of interest.

CONSORTIUM: A group of state agencies, institutions, or other entities which have been legally constituted through letters of commitments, agreements, or by assignment of higher authorities to work together toward the solution of problems in education. A membership from autonomous agencies and institutions which cuts across state boundaries as they attempt to solve problems or meet goals.

D.O.T. CODE: A nine-digit number used to identify a specific job within a given domain.

INSTRUCTIONAL SYSTEM DEVELOPMENT (ISD): A deliberate, orderly process for planning and developing instructional programs which insures that personnel are taught the knowledge, skills, and attitudes essential for successful job performance. Depends on a description and analysis of the tasks necessary for performing the job, objectives, evaluation procedures to determine whether or not the objectives have been reached, and methods for revising the process based on empirical data.

OCCUPATIONS INVENTORY (TASK INVENTORY BOOKLET): A survey instrument containing tasks performed by job incumbents within D.O.T.'s complete with background information and a list of tools and equipment.

PERFORMANCE-BASED INSTRUCTION: Instruction which, when properly designed and applied, results in the learner's demonstration of certain abilities. The desired abilities are selected before the instruction is designed and are clearly defined as observable performance objectives. In V-TECS catalogs, the abilities are primarily psychomotor. This type of instruction is also referred to as competency-based instruction.

PERFORMANCE GUIDE (PG): A series of steps, arranged in a sequence ordinarily followed, which when completed may result in the performance of a task. Also, called "teaching steps."

PROJECT: An occupational domain area selected by a V-TECS member state for catalog development based upon the U.S. Department of Labor's Dictionary of Occupational Titles (D.O.T.).

STATE-OF-THE-ART (SOA STUDY): Research conducted to determine the current status of performance-based instructional materials and practices in the domain area under study and to obtain other information that might be used in catalog development.

TASK: A unit of work activity which constitutes logical and necessary steps in performance of a duty. A task has a definite beginning and ending point in its accomplishments and generally consists of two or more definite steps.

TASK ANALYSIS: A characteristic of a task statement which makes its accomplishments crucial to the acceptable performance of a worker or student. A method of analysis which identifies the critical tasks and aids in determining the consequence of poor performance or lack of performance by a worker or student.

WRITING TEAM: A team of people representing instructors with subject matter expertise, persons having knowledge and experience in developing criterion-referenced measures, local or state supervisors of incumbent workers whose function is to analyze occupational data and develop performance objectives and criterion-referenced measure for specific D.O.T. areas.

APPENDIX C

TOOL AND EQUIPMENT LIST

Programs
Files
Data base to be run on computer
Input device
Computer hardware
Computer printer
Continuous paper for printer
Ribbon
Source document
Data record layout
Key entry specifications
Malfunctioning CRT terminal
Data-entry equipment with recording medium
Existing file
Existing records
Instructions for modification
Form specifications
Operating computer system with disks, diskettes, tapes, or cards
Reuseable tapes, disks, or diskettes
Identified I/O devices
Layout forms
Flowcharting sheets
Flowcharting template
Program (general) flowchart
I/O record layouts
User's specifications
Program specifications
Data record layouts
Programming reference manuals
Detail flowchart
Coding sheets
Established test data
Outputs
Inputs
Test conditions and results

APPENDIX D

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Related Resources

Appropriate software packages
Student Information Sheets: Repair Form, Job Instruction Sheet
Operational manual for computer being used
Disk system owner's manual
Operational manual for the specified printer